FIFTH QUARTERLY SUMMARY REPORT OF PROGRESS

Services Provided in Support of the Planetary Quarantine Requirements
of the
National Aeronautics and Space Administration

REDUCTION OF BACTERIAL DISSEMINATION

GERMICIDAL ACTIVITY OF ETHYLENE OXIDE

REDUCTION OF BACTERIAL CONTAMINATION ON SURFACES

by the

Biophysics Section, Technology Branch
Communicable Disease Center
Public Health Service
U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

November 1965

FIFTH QUARTERLY SUMMARY REPORT OF PROGRESS

Reduction of Bacterial Dissemination - - Investigations on reduction of microbial dissemination from humans were continued. The purpose of the study reported here was to obtain comparative data on microbial shedding by one subject (a) dressed in street clothing, (b) dressed in a sterile surgical scrub suit including cap and socks, and (c) dressed as in (b) but with a surgical face mask. The masks used during this study were sterile and disposable, made of pressed fiber (Adaptic*, Johnson and Johnson).

The study was conducted over a period of 3 weeks, with 5 evaluations of shedding per week. The subject showered daily with a germicidal detergent (pHisohex*) approximately 12 hours before each shedding evaluation. The results are shown in table 1.

---

* Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or by the U. S. Department of Health, Education, and Welfare.

TABLE 1

Shedding of Viable Bacterial Particles by a Subject in Street Clothes and in Sterile Surgical Garb with and without a Sterile Surgical Mask

Evaluation Number	Bacterial Particles Shed per Minute		
	Type of Garb		
	Street Clothing	Sterile Scrub Suit with Cap & Socks	Sterile Scrub Suit with Cap & Socks plus Mask
1	1,320	11,000	293
2	1,100	1,060	140
3	1,860	1,160	407
4	3,460	1,460	830
5	5,230	1,030	546
Averages	2,590	3,140	443

It appears from these preliminary data that dissemination of viable microorganisms can be reduced by wearing a sterile, efficient surgical face mask.

Reduction of Bacterial Contamination on Surfaces - - Methods for optimum contamination of surfaces with human microorganisms without laboratory seeding were investigated in studies on the reduction of bacterial contamination during exposure to conditions of 50°C and 40% relative humidity.

It is desirable to obtain maximum microbial contamination of surfaces during short periods of exposure in an attempt to avoid natural selection. It is equally important to minimize variation of contaminating loads between surfaces serially exposed. Studies indicate that these criteria are best met by exposure of surfaces in a dynamic exposure chamber in which human shedding is occurring. This method appears to be superior to exposure of surfaces in areas of moderate human activity. Table 2 illustrates contamination loads and variations obtained using both methods. Attempts are being made to reduce the variation found.

Studies have been initiated on the reduction of viable particles on naturally contaminated surfaces exposed to environmental conditions of 50°C and 40% RH. Stainless-steel strips naturally contaminated with organisms shed by humans were held under these environmental conditions, and samples were examined for viable organisms at various time intervals. Data from a limited number of tests suggest that death rates during the first 24 hours of exposure are low. Further tests are now in progress.

TABLE 2

Natural Contamination of Stainless-Steel Strips During Two Different Exposure Procedures

Strip No.	Viable Microorganisms/Square Centimeter	
	Exposure for 72 Hours in Area of Moderate Activity	Exposure for one Hour in a Dynamic Exposure Chamber
1	2.27	4.80
2	0	1.63
3	0	0.93
4	0	2.56
5	0.69	4.80
6	0.76	2.56
7	0.69	1.40
8	3.79	0.47
9	0.69	3.03
10	7.64	2.56

Exposure of Stainless Steel Strips to Intramural Air of a Hospital Operating Room - - Materials and methods used for this study closely follow those described by Favero, et al., "Detection and Quantitation

of Microbial Contamination to which Spacecraft Components are Subjected during Manufacture", preliminary mimeographed report to the NASA, March 18, 1965.

A group of sterile, stainless-steel strips were placed in a sterile tray on a Mayo stand in one corner of an operating room in a hospital in Savannah, Georgia. Six strips were selected at random for microbiological examination each week for 4 weeks. Thereafter, examinations are made every other week. Enumerations of aerobic and anaerobic non-spore-forming and spore-forming (determined by heat shocking at 80°F for 15 minutes prior to plating) bacteria were performed during each examination. Results obtained from the first 8 examinations (11 weeks of exposure) are shown in table 3.

The unusually high counts of the strips examined at weeks No. 3 and 4 and the subsequent reduction were investigated. All laboratory controls for sterility of media and glassware showed no contamination. Investigation of surgical activity in the study operating room revealed that a body cast had been removed from a patient and a hip pinning performed several days before the examinations made at week No. 3. However, the relationship of these procedures with the high levels of microbial contamination of the stainless steel strips can only be speculative.

TABLE 3

Microorganisms deposited on Sterile Stainless-Steel Strips Exposed to Intramural Air in a Hospital Operating Room

Exposure Time in Weeks	Number of Microorganisms			
	Unheated		Heat Shocked	
	Aerobic	Anaerobic	Aerobic	Anaerobic
1	9,720	1,870	94	0
2	18,700	3,600	1,580	216
3	4,810,000	5,460,000	180	115
4	5,460,000	8,960,000	288	144
6	43,900	11,700	720	288
7	30,200	10,100	2,380	216
9	53,300	16,600	2,160	576
11	32,300	14,400	4,680	720

Germicidal Activity of Ethylene Oxide - - In an attempt to control variations in temperature, humidity, and gas concentration in the test chamber, more accurate and sensitive controls are being procured, installed, and calibrated for use as rapidly as possible. Both the humidity and temperature controls replaced by the manufacturer were found unreliable, thus causing further delays.

Assembly of the dynamic, ethylene-oxide gas chamber is approximately 60 percent complete. Components and instrumentation for this system are being checked and calibrated. Final assembly and calibration should be completed shortly.

Biophysics Section
Technology Branch
Communicable Disease Center
November 12, 1965